

What is claimed is:

- 1 1. A method for maintaining blade tip clearances under part load turbine
- 2 operation comprising the steps of:
 - 3 operating a turbine engine under part load, the engine having a rotor with
 - 4 discs on which a plurality of turbine blades are attached;
 - 5 supplying cooling air to the rotor and discs at a substantially constant design
 - 6 rotor cooling temperature; and
 - 7 reducing the temperature of the cooling air supplied to the rotor and discs to a
 - 8 temperature below the design rotor cooling temperature,
 - 9 wherein exposure to the reduced temperature rotor cooling air causes the
 - 10 rotor and discs to shrink.
- 1 2. The method of claim 1 wherein the substantially constant design cooling
- 2 temperature is from about 350 degrees Fahrenheit to about 480 degrees Fahrenheit.
- 1 3. The method of claim 1 wherein the turbine engine includes a compressor
- 2 section having an inlet and an outlet, a plurality of inlet guide vanes being movably
- 3 positioned at the compressor inlet.
- 1 4. The method of claim 3 further including the step of:
 - 2 moving the inlet guide vanes to a closed position so as to reduce the mass
 - 3 flow of air through the turbine engine,
 - 4 whereby the combustor exit temperature increases and the compressor exit
 - 5 temperature decreases.
- 1 5. The method of claim 1 wherein the temperature of the cooling air is reduced
- 2 to about 150 degrees Fahrenheit at about 70 percent load.
- 1 6. The method of claim 1 wherein the temperature of the cooling air is reduced
- 2 to less than about 350 degrees Fahrenheit.

1 7. A turbine engine assembly comprising:
2 a turbine engine having a compressor section, a combustor section and a
3 turbine section, the compressor section having an inlet and an exit, the turbine
4 section including a rotor with discs on which a plurality of turbine blades are
5 attached, the turbine engine configured so as to supply cooling air to the rotor and
6 discs at a substantially constant design temperature, wherein the engine is operating
7 under a part load condition; and
8 a cooling circuit configured to reduce the cooling air temperature to a
9 temperature below the design temperature.

1 8. The assembly of claim 7 wherein the cooling circuit includes an intermediate
2 pressure kettle boiler, a low pressure kettle boiler and a heat exchanger connected
3 in series.

1 9. The assembly of claim 8 wherein the heat exchanger uses economizer water
2 as the sink.

1 10. The assembly of claim 8 wherein the heat exchanger uses condenser water
2 as the sink.

1 11. The assembly of claim 8 further including a circuit for at least partially
2 bypassing the heat exchanger.

1 12. The assembly of claim 7 wherein the cooling circuit reduces the temperature
2 cooling air to below about 350 degrees Fahrenheit.

1 13. The assembly of claim 7 wherein the cooling circuit includes at least one heat
2 exchanger.

1 14. The assembly of claim 13 wherein the at least one heat exchanger is a fin-fan
2 cooler.

1 15. The assembly of claim 7 wherein the turbine engine is part of a simple cycle
2 system.

1 16. The assembly of claim 7 wherein the turbine engine is part of a combined
2 cycle system.

1 17. The assembly of claim 7 wherein the cooling circuit reduces the rotor cooling
2 temperature to about 150 degrees Fahrenheit when the engine is at about 70% load.

1 18. The assembly of claim 7 wherein the substantially constant design cooling
2 temperature is from about 350 degrees Fahrenheit to about 480 degrees Fahrenheit.